

SPECIALTY POTATOES  
A COLORFUL ADDITION TO THE WASHINGTON POTATO INDUSTRY

by  
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Yellow fleshed potatoes are the rule rather than the exception in most countries of the world. In the United States, yellow fleshed cultivars, along with other uncommon potato cultivars, are called specialty potatoes and interest in this type of potatoes is increasing. Some specialty potatoes have been available in the United States for many years, often as heirloom cultivars grown by small-scale farmers. Yet these cultivars and yellow fleshed cultivars brought from abroad were considered to have little commercial value. Yellow fleshed cultivars and clones were dropped from breeding programs. With increased consumer demand for specialty potatoes, potato breeders in the United States and Canada have begun to release some excellent yellow fleshed cultivars.

Beginning in 1987 a series of on-farm trials and observations was conducted in the south Columbia Basin to evaluate specialty potatoes. Since then nearly 200 specialty potato cultivars and clones have been tested. The potatoes grown in these trials have been evaluated for agronomic characteristics and market acceptance. In addition to yellow fleshed potatoes, cultivars with pink or purple flesh and skin colors ranging from buff to red have been grown. Some of these potatoes are breeding lines or European cultivars unavailable to Washington farmers. The agronomic characteristics evaluated included insect and disease resistance, ease of harvesting, and relative yield. Quality is of paramount importance to the market acceptance of any potato. For the fresh market, appearance is the most obvious component of quality and strongly influences sales. Color, size, shape, and defects, if present, are important because they shape consumers first impression of quality. Texture, flavor, and nutritive value less obvious, but still important quality components. These may have little initial effect on sales of a particular variety, but can have a great influence on subsequent sales.

At least three cultivars identified in the on-farm trials are now being grown commercially in the state: 'Yukon Gold', 'Yellow Finn', and 'Purple Marker'. 'Yukon Gold' is a yellow fleshed potato released in Canada in 1980. Grown primarily as a fresh market potato, 'Yukon Gold' has a smooth, round shape and excellent baking qualities. It has a yellow or buff colored skin with pink shading around the eyes. 'Yellow Finn' has flattened tubers with deep eyes and dark yellow flesh. It was selected in Washington state from a Finnish potato, 'Olympia', in the 1950's and has become the most popular specialty potato for the fresh market.

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'Purple Marker' is an oblong potato with purple skin and purple flesh. The striking appearance of 'Purple Marker', or 'All Blue' as it is also called, led to its use by potato breeders as a marker for the ends of potato plots. It can be baked or boiled and the purple flesh color is retained even after cooking. Other cultivars have also been identified as having commercial potential. These include specialty potatoes that fall into several categories: yellow fleshed with buff or yellow skin- 'Delta Gold' and 'Donna'; yellow fleshed with red or pink skin- 'Desiree', 'Iditared', and 'Red Gold'; yellow fleshed with purple skin- 'Brigus'; and small sized or fingerling potatoes- 'Banana'.

To measure yields, tubers were dug by hand, separated according to size, and weighed. Results are given in Table 1. Yields are given in pounds harvested per plot with total marketable yields calculated on a hundred weight per acre basis. At 94 days after planting, 'Donna', 'Desiree', and 'Bintje' were the highest yielding cultivars. When harvested at 143 days, 'Spunta', 'Delta Gold', 'Brigus', and 'Donna' gave the highest yields of marketable tubers. Many of the specialty potatoes tested have given yields greater than 'Russet Burbank'. In Table 3, the lowest yields at both harvest dates were with the fingerlings due to their small tuber size. 'Yukon Gold' had the highest percentage of large tubers. 'Donna' and 'Desiree' also produced a high percentage of A size tubers. This is generally the most desirable size for yellow fleshed potatoes. 'Yellow Finn', however, is an exception. Smaller sized tubers of this particular cultivar are preferred in the marketplace. With red skinned cultivars, the small C size demand the highest prices.

Table 1. Yield of Specialty Potatoes at 94 Days After Planting.

	<u>Pounds/Plot</u>				<u>CWT/Acre</u>	
	<u>Total</u>	<u>A Size</u>	<u>B Size</u>	<u>C Size</u>	<u>Marketable</u>	<u>Marketable</u>
<i>Banana</i>	21.88	0.00	0.00	18.26	18.26	132.6
<i>Bintje</i>	42.98	21.53	15.24	2.40	39.17	284.5
<i>Brigus</i>	38.94	25.38	10.16	2.40	37.94	275.5
<i>Desiree</i>	40.83	32.75	6.80	0.98	40.53	294.4
<i>Donna</i>	46.63	32.17	10.43	1.20	43.80	318.1
<i>I P Peruvian</i>	7.62	0.00	0.00	5.82	5.82	42.3
<i>MN 13420</i>	28.16	16.44	10.28	0.81	27.53	199.9
<i>Purple Marker</i>	30.07	4.98	20.56	3.88	29.42	213.7
<i>Red Gold</i>	38.24	24.02	11.29	1.55	36.86	267.7
<i>Russet Burbank</i>	29.95	17.16	6.54	0.00	23.70	172.1
<i>Urgenta</i>	36.95	12.25	10.10	14.10	36.45	264.7
<i>WP 204-9</i>	1.71	0.00	0.00	3.23	3.23	23.5
<i>Yellow Finn</i>	23.77	12.25	10.02	1.10	23.37	169.7
<i>Yukon Gold</i>	28.78	24.42	2.68	0.18	27.28	198.1

The dark yellow flesh of 'Yellow Finn' has become something of a standard for yellow fleshed potatoes. By comparison, 'Yukon Gold' and 'Brigus' have flesh that is relatively light yellow in color. Many European cultivars also have light yellow flesh. Using a quantitative measurement, the flesh and skin color of several specialty potatoes was measured at three harvest dates. In Table 2, Y is used as a measure of lightness. 'Yellow Finn' had the lowest Y value, signifying the darkest yellow flesh, at each harvest date. 'Purple 4' had the next darkest flesh color. The flesh color of all cultivars darkened at the length of season increased. At 143 days after planting, 'Desiree', a Dutch cultivar, had the lightest yellow flesh color and the highest Y value.

Table 2. Lightness of Yellow Flesh Color of Specialty Potatoes at Three Harvest Dates.

	<u>Y (percent Lightness)</u>		
	<u>93 Days</u>	<u>110 Days</u>	<u>143 Days</u>
<i>Banana</i>	--	--	36.76
<i>Brigus</i>	39.62	39.11	33.69
<i>Desiree</i>	--	--	38.27
<i>Iditared</i>	39.28	39.11	36.37
<i>Purple 4</i>	36.73	32.90	32.09
<i>Yellow Finn</i>	31.78	31.66	28.55

A measurement of red skin color is given in Table 3. 'Iditared' is a red skinned potato bred for short growing season areas. It is reported to color early and be resistant to feathering. Compared to two other red skinned cultivars in this observation, 'Iditared' had a darker red skin and lower Y value at two early harvest dates. 'Dark Red Norland' had the lightest red skin.

Table 3. Lightness of Red Skin Color at Two Harvest Dates.

	<u>Y (Percent Lightness)</u>	
	<u>93 Days</u>	<u>110 Days</u>
<i>Dark Red Norland</i>	13.52	11.83
<i>Iditared</i>	11.37	8.38
<i>Sangre</i>	11.68	10.28

Potato tubers exhibit a wide range in texture, flavor and nutritive value. Flavor has been cited as one of the reasons for the market success of specialty potatoes. The factors that make up flavor are complex, but two of the major components are acids and sugars. The range in values for acidity and total sugars at 143 days after planting are given in Table 4. The samples of specialty potatoes from these observations were analyzed by the Food Science and Human Nutrition Department at Washington State University. 'Spunta' had the highest level of titratable acid and 'Red Gold' the lowest. 'Improved Purple Peruvian' had the highest level of sugars.

Table 4. Titratable Acidity and Total Sugars of Specialty Potatoes at 143 Days After Harvest.

	<u>Percent (Fresh Weight Basis)</u>	
	<u>Titratable Acidity</u>	<u>Total Sugars</u>
<i>Alpha</i>	0.10	0.93
<i>Brigus</i>	0.10	0.80
<i>Caribe</i>	0.11	1.04
<i>Desiree</i>	0.12	1.48
<i>Improved Purple Peruvian</i>	0.13	3.03
<i>McIntyre</i>	0.12	1.20
<i>Purple Marker</i>	0.06	1.20
<i>Red Gold</i>	0.09	1.00
<i>Spunta</i>	0.16	1.27
<i>Urgenta</i>	0.10	0.97
<i>Yellow Finn</i>	0.08	1.08

Table 5 shows moisture, solids, protein, fat, carbohydrates (CHO), and ash on a fresh weight basis at 94 days after planting. There is a high correlation between texture and solids or dry matter. A mealy texture is associated with high solids, a waxy texture with low solids. 'Desiree' and 'Donna' had solids of over 23 percent. At the other extreme, 'Red Gold' had solids of only 15.7 percent. Protein levels ranged from 2.7 percent for 'Donna' to 1.7 percent for 'Improved Purple Peruvian'. There were also differences measured between varieties in fat, carbohydrate, and ash or mineral levels. 'Russet Burbank' was added as a check for comparison.

Potatoes are a nutritious crop and specialty potatoes that have a high nutritive content are valuable for human nutrition. High nutritive content can also be used to market specialty potatoes. Yellow fleshed cultivars in general have higher vitamin A levels than do white fleshed cultivars. It also appears that the darker the yellow flesh color the higher the level of vitamin A. Vitamin A levels, measured as beta carotene, are given in Table 6.

The highest levels of beta carotene were found in 'WP 209-4', a clone with almost orange colored flesh. Of the commercially available cultivars, 'Yellow Finn' and 'Red Gold', both with dark yellow flesh, had the highest levels. The purple fleshed cultivars tested and 'Russet Burbank' had relatively low levels of beta carotene.

Table 5. Nutritive Content of Specialty Potatoes at 94 Days After Planting.

	<u>Percent (Fresh Weight Basis)</u>					
	<u>Moisture</u>	<u>Solids</u>	<u>Protein</u>	<u>Fat</u>	<u>CHO</u>	<u>Ash</u>
<i>Banana</i>	78.4	16.3	2.3	0.0	13.4	0.6
<i>Bintje</i>	82.1	17.9	2.0	0.1	14.9	1.0
<i>Brigus</i>	78.1	21.9	1.8	0.2	19.0	1.1
<i>Desiree</i>	76.2	23.8	1.8	0.8	21.0	0.8
<i>Donna</i>	76.5	23.5	2.7	0.4	19.8	0.9
<i>I P Peruvian</i>	77.9	22.1	1.7	0.1	19.3	1.1
<i>MN 13420</i>	82.3	17.7	1.9	0.0	14.8	1.0
<i>Purple Marker</i>	83.7	16.3	1.8	0.1	13.7	0.8
<i>Red Gold</i>	84.3	15.7	2.1	0.3	12.7	0.9
<i>Russet Burbank</i>	80.0	20.0	2.2	0.2	16.8	1.0
<i>Urgenta</i>	78.4	21.6	2.4	0.1	18.3	0.9
<i>Yellow Finn</i>	78.4	21.6	2.0	0.0	18.9	0.7
<i>Yukon Gold</i>	77.3	22.7	2.6	0.1	19.4	0.7

Table 6. Beta Carotene Levels of Specialty Potatoes at 94 Days After Planting.

	<u>Beta Carotene</u>
	<u>(Micrograms/Gram Fresh Weight)</u>
<i>Banana</i>	185.0
<i>Bintje</i>	143.0
<i>Brigus</i>	79.6
<i>Desiree</i>	120.8
<i>Donna</i>	146.9
<i>Improved Purple Peruvian</i>	57.8
<i>MN 13420</i>	47.0
<i>Purple Marker</i>	14.3
<i>Red Gold</i>	205.4
<i>Russet Burbank</i>	43.3
<i>Urgenta</i>	88.6
<i>Yellow Finn</i>	218.1
<i>Yukon Gold</i>	177.4

Most specialty potatoes are no more difficult to grow commercially than traditional cultivars, but marketing presents a challenge. To successfully market specialty potatoes, farmers need to work together with those who sell and promote vegetables. Specialty potato growers were fortunate to have purple potatoes among the produce items promoted by Frieda Kaplan at the national level. Specialty potatoes have also received national attention through articles in produce trade journals and the popular press. A number of supermarket chains have featured yellow fleshed potatoes. At Larry's Supermarket in Seattle, a 4th of July promotion featured red, white, and blue potatoes. Without such efforts it is difficult to move specialty items beyond local markets and into the mainstream of American produce.

Specialty potatoes have been among the crops featured at the "Taste of Washington Farms" program at the Pike Place Market in Seattle. These displays of yellow fleshed and purple potatoes have been seen by over 20,000 food professionals and consumers. In Oregon specialty potato cultivars, such as 'Donna', have fared especially well in comparative taste tests. Marketing specialty potatoes is complicated by the fact that most potatoes are not sold by cultivar name. Some specialty potatoes have characteristics that lend themselves to product differentiation. 'Yellow Finn', for example, has a characteristic flattened shape and deep eyes. 'Yukon Gold' is distinguished by the pink coloration around its eyes. Packaging can also be important to success in the market place. Bags that display the cultivar name along with cooking or nutritional information are useful.

Approximately 80 percent of the Washington state potato crop is processed. Eventually there may be potential for some specialty cultivars as processed potatoes. Yellow fleshed cultivars have already been bred that can be used for either fresh market or processing. 'Saginaw Gold', for example, produces a chip with good color and taste. Purple or pink potato chips and yellow french fries are among the future possibilities for processed specialty potatoes.

The people that make up the Washington state potato industry can take pride in the fact that their potatoes have more than their competitors - the highest yields per acre in the nation and a higher nutritive value than the average potato grown in the United States. Washington state should also be known as having more variety. With per capita fresh potato consumption static or on the decline, the variety offered by specialty potatoes can add to sales. Although there are hurdles, specialty potatoes have a future in Washington. They will never completely replace the traditional white fleshed, russet potato, but specialty potatoes will be a colorful addition to the Washington potato industry.